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Control of Honeysuckle and Kudzu

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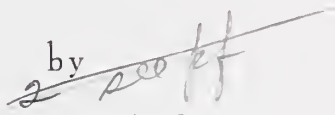
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Control of Honeysuckle and Kudzu

by 
E. V. Brender¹

HISTORY OF HONEYSUCKLE AND KUDZU

Japanese honeysuckle (*Lonicera japonica* Thunb.) and kudzu (*Pueraria thunbergiana* (S. & Z.) Benth.) were introduced into this country from Asia—honeysuckle for its delicious odor at blossom time, and kudzu for the quick shade it provides for porches. Honeysuckle soon escaped into hedgerows and forests from seed disseminated by birds. Once a honeysuckle seedling becomes established, it also propagates from stolons which on favorable sites spread as much as 15 feet in a year. No wonder honeysuckle today occurs on about 10 percent of the forests in the lower Piedmont of Georgia (Nelson, 1953) and on 8 percent of the forests of Maryland (Bond, 1956).

Kudzu, since it seldom produces viable seed, stayed for a long time confined to the porch. When farmlands and homes were abandoned and neglected, kudzu soon wrapped up houses and trees, spread into fields and woods, but still on a localized scale (fig. 1).

The spread of both vines received an impetus during the Civilian Conservation Corps days when they were planted for roadbank fixation. In addition, kudzu was promoted for gully control, meadow strips, and supplemental pastures. This vine is difficult to confine to allotted areas and when allowed to run wild, which happens on both

abandoned and managed farms, the results are spectacular, since some of the runners will grow as much as 30 feet in a single year.

USES OF HONEYSUCKLE AND KUDZU

Honeysuckle has some economic value for winter grazing, and it has contributed to the survival of many cattle during food shortage periods. Kaufman (1950) studied its value as a forage crop and found that cattle gained weight during the first year of summer grazing luxuriant honeysuckle, but succeeding years of grazing resulted in shortened grazing periods and reduced gains in weight. In the fourth year the grazing period lasted only 6 weeks and the gain per animal unit was only 3 pounds, as against a gain of 76 pounds during the first year's 10 months' grazing. This indicates that regrowth of honeysuckle diminished as a result of repeat summer grazing.

Honeysuckle is also valuable as game food, especially for deer browse during the winter months, but the volume of browse available in the Piedmont far exceeds the needs. In fact, honeysuckle seriously interferes with the growth of other browse species.

Kudzu is rich in proteins, and it is rated equal to alfalfa in food value. It provides supplemental summer grazing during drought periods when other forage is short in supply, and as a hay crop, it is very nutritious. Cattle gain weight on a kudzu forage diet, but the species is difficult to manage and can be killed by overgrazing.

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Figure 1.—An abandoned house wrapped up in kudzu.

THE PROBLEM

The problem, then, is one of confining honeysuckle and kudzu to specified areas. Either vine forms a dense mat of vegetation, covering everything in its path, smothering shrubs, tree seedlings and saplings, and absolutely inhibiting the establishment of a new crop of trees (fig. 2). Kudzu can climb the tallest trees and smother them (fig. 3), but honeysuckle is the more serious problem. It occurs more extensively and even though eliminated from an area, it can readily re-invade from seed disseminated by birds or flood waters. On some sites honeysuckle control may constitute an

ever recurring problem at times of future stand regeneration. In pulpwood-size and larger timber stands honeysuckle does not threaten the over-story trees. Shading and needle cast in well-stocked pine stands keep it in check (fig. 4), but when the stand is opened up by heavy thinning, incipient honeysuckle will spread again (fig. 5).

Kudzu presents a more localized problem. Under proper management, it could be confined to specific use areas. If it is once eliminated from an area, control has been accomplished, and the only way to bring it back is by planting new kudzu crowns.



Figure 2.—A good bottom site capable of growing 2 cords of wood or 600 board feet annually per acre. Unless the honeysuckle is controlled and a new crop of trees established, this area will become non-productive after the present stand is cut.

Figure 3.—(Below) Kudzu smothering a 70-foot loblolly pine tree. Each year kudzu keeps encroaching deeper and deeper into the forest.

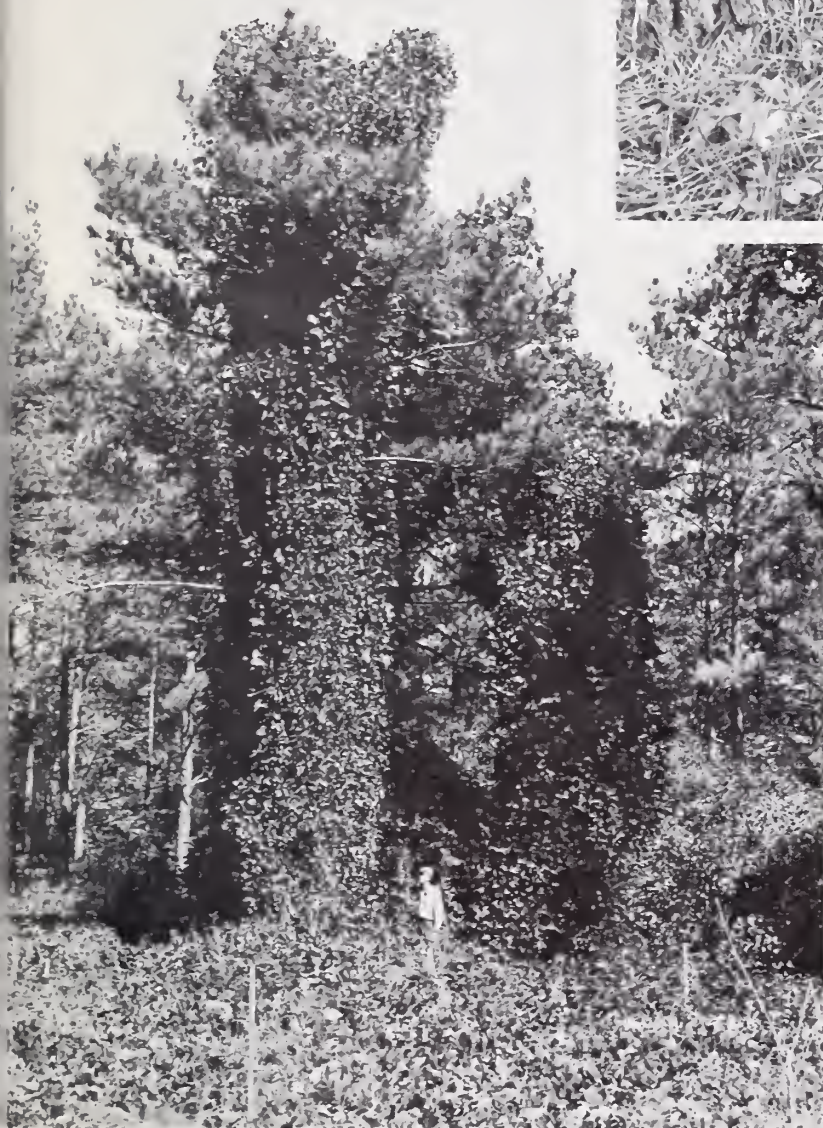


Figure 4.—(Above) In a well-stocked stand of pines, needle cast and shading will temporarily keep honeysuckle in check.

Figure 5.—(Below) In open-grown or heavily thinned stands on good sites honeysuckle takes over, precludes establishment of trees, and chokes out fairly large saplings.



ECOLOGY OF HONEYSUCKLE AND KUDZU

Honeysuckle has become naturalized south of the 30-degree January isotherm and within the 40-inch annual precipitation limit (Leatherman, 1955). This covers the region south from Connecticut, southern Ohio and southern Missouri, and south through eastern Oklahoma and Texas (fig. 6). Honeysuckle thrives on fertile, nitrogen-rich soil, where an established colony spreads in geometric proportions to its perimeter until nitrogen-poor sites are encountered. It grows lush on soils of site index 80 and better for loblolly pine, but on soils of site index 70 and less it is not a serious problem. Honeysuckle spreads vegetatively by layering, the runners developing new roots and shoots at short intervals, and starts growing at temperatures of 34° to 48° F. It has a rather shallow root system that grows to a depth of 6 to 12 inches on moist sites, but on dry sites may penetrate to a depth of 3¼ feet. Branch roots may extend laterally for a distance of 8½ feet.

The vine is very drought resistant. Honeysuckle also produces a prolific amount of seed and the requirements for stratification and germination of honeysuckle seed are met under forest conditions of the lower Piedmont. When alternating temperatures of 68° and 86° F. were used in laboratory germination tests, 85 percent of the honeysuckle seed germinated.

Kudzu differs from honeysuckle in many respects. For instance, honeysuckle in the South retains much of its foliage throughout the winter, while the leaves of kudzu are shed after the first frost. Kudzu does not commence growing at such low temperatures as honeysuckle, and it seldom produces viable seed, spreading instead almost exclusively by stolons and rhizomes. Its range probably does not extend as far north as that of honeysuckle. The root system of kudzu is fleshy, and it penetrates much deeper into the soil than honeysuckle, with a taproot that may get as large as 3 inches in diameter and 6 feet in length. Since kudzu is a nitrogen-fixing plant, it can continue to grow — provided it gets established — on much poorer sites than honeysuckle.



Figure 6.—Honeysuckle has become naturalized in the area south of the 30° F. January isotherm and within the 40-inch annual precipitation limit.

CONTROL MEASURES

Any treatment that deprives the vines of summer foliage will weaken them, but to kill the vines the leaves need to be stripped again and again until the energy reserves in the root system are exhausted. Another approach to killing the vines is to tackle the root system directly by mechanical means or possibly through heat generated by burning, or indirectly by applying toxic substances to the foliage for translocation to the roots of the plants. Other approaches might take advantage of all these principles.

During the past 9 years, diversified efforts were made on the Hitchiti Experimental Forest toward finding control measures for honeysuckle and kudzu. Investigations included grazing, burning, harrowing, mulching, the use of herbicides, and certain combination methods.

Grazing

Winter grazing of honeysuckle in the forests, prior to stock laws, was a common practice throughout the South and is still practiced in many farmwoods. Even though cattle stripped all the foliage winter after winter, no honeysuckle has ever been killed from winter grazing. On the Hitchiti Experimental Forest 35 acres of woods covered with dense honeysuckle were fenced and winter grazed by 13 head of cattle for two successive years. After 2½ months' grazing, the honeysuckle was completely defoliated and the runners heavily browsed. During the first year's winter grazing the herd lost 220 pounds in weight, and the cattle had to be moved or they would have starved. By early summer the honeysuckle appeared to be almost as lush as before grazing, and the second year's results were the same.

Summer grazing is probably more detrimental to honeysuckle than winter grazing. As pointed out earlier, four successive years of summer grazing reduced the available forage from 10 months to 6 weeks of grazing at which time the gain per animal unit was only 3 pounds. It would take several more years of summer grazing to eliminate honeysuckle. From a cattle grower's viewpoint, long-term grazing of honeysuckle would not be economical. A few years of summer grazing, however, will weaken the plants and a follow-up treatment with herbicides might finish the job.

Overgrazing of kudzu during the summer months can kill it, but cattle must be kept on it, or brought back to graze whenever a new cover

of foliage appears. Two summer seasons of overgrazing, as outlined, will eliminate kudzu except for the vines that are beyond the reach of cattle.

Uses of Fire

Twenty years ago, when the forests of the Piedmont were burned over promiscuously, honeysuckle was far less extensive than it is today. The benefit of wildfire in controlling honeysuckle was in curtailing establishment rather than in controlling established colonies. Fire will burn up the stolons and seed in the duff, and possibly destroy young seedlings and early season root systems that spring from stolons. Soil is a poor conductor of heat and that generated by burning honeysuckle does not penetrate far into the soil. Lush honeysuckle does not burn well; but when pine litter is present, fire will burn through it rather slowly and consume the ground cover of honeysuckle to the bare soil. Honeysuckle will sprout again but somewhat delayed over that following grazing. Fire is a useful pre-treatment for spraying with herbicides, and it can also be used to advantage as a follow-up treatment to spraying. The dead ground cover of honeysuckle burns readily; fire consumes the seed in the litter and exposes future honeysuckle sprigs for mop-up spraying.

Winter burning of kudzu when the leaves are dead is also a good pre-treatment. It not only facilitates later spraying with herbicides, but also exposes the soil to freezing which is detrimental to kudzu rhizomes.

Mechanical Methods

Rank honeysuckle and kudzu form several layers, often waist high, and it is difficult to get complete coverage of the foliage when applying herbicides under these conditions. To reduce these build-up areas and to get a more uniform shallow cover for subsequent spraying when the vines re-sprout, honeysuckle and kudzu areas can be plowed with a heavy-duty tandem harrow. This also facilitates the use of vehicle-mounted power sprayers and makes the area accessible for portable spray machines. But pre-harrowing seems to create a problem of delayed sprouting from stolons and rhizomes buried at various depths. Harrowing after the plants are weakened from herbicide application is a better follow-up treatment than a pre-treatment. In several areas on the Hitchiti

Experimental Forest this combination treatment has been very successful. The use of harrows, however, is limited to open-grown stands.

Sawdust Mulching

Since honeysuckle is intolerant and is a nitrogen-demanding plant, a treatment that deprives it of both light and nitrogen should kill it. Sawdust applied as a heavy mulch will do this. The amount of sawdust needed depends upon the uniformity of the honeysuckle cover; where cover is confined to the ground, a 3-inch layer of sawdust will do the job. A pre-harrowing treatment or a prescribed burn would reduce the amount of sawdust needed. The mulching treatment may be useful in a garden patch.

Use of Herbicides

None of the aforementioned treatments, except mulching, eliminate honeysuckle or kudzu, but they are useful as pre- or post-treatments in conjunction with herbicide applications. Almost any herbicide will strip the foliage from these two vines and, if applied often enough, will kill them the same as continuous summer grazing. Frequent herbicidal applications, however, are not economical. A more adequate treatment that does the job in one or two applications by killing the roots must be found.

Herbicides are selective to some degree, depending upon the structure and growth habits of the plant and the toxicity of the herbicide to the plant. Herbicides are not translocated downward very far for they soon kill the phloem or cambium, and downward translocation stops. But with plants like honeysuckle and kudzu, where the root system is not far removed from the foliage, a short distance of translocation may reach into the roots. Herbicides are most effective if applied at times when environmental conditions and physiological conditions of the plant are right for good growth. Inconsistent results from herbicide treatments are often the result of differences in the growing condition of plants.

Numerous screening tests with hormone and non-hormone herbicides at different concentrations and rates were applied to honeysuckle and kudzu. Different carriers, such as water (with and without wetting agents), kerosene, fuel oil, and non-phytotoxic oil were tried with various herbicides. In the earlier screening tests, knapsack sprayers were used on small plots 33 by 33

feet. It soon became apparent that border effects on small plots obscured the results. Thereafter, 0.1-acre plots were installed and a power sprayer, equipped with hose and adjustable nozzle, was used at pressures of 75 to 100 pounds. This gave a relatively coarse, cone-shaped spray that provided good coverage of the foliage, putting out 150 to 200 gallons per acre (fig. 7). The latest efforts in method of spraying have been directed toward the use of mist blowers.

A total of 19 chemicals were tested in different mixtures with varying degrees of success. Some herbicides merely stripped the leaves but the plants recovered promptly; others gave mediocre control; a few provided satisfactory control in two applications. Those that gave satisfactory control are described for each species of vine, the others are listed in the Appendix.

For honeysuckle.—Where pine regeneration is the objective, honeysuckle needs to be eliminated or weakened so that it cannot regain good vigor before pine reproduction makes a dense shade and needle cast commences.

Application of a mixture of 2,4-D and 2,4,5-T, formulated in butoxy ethanol ester or in isooctyl ester, ratio 2:1, 2 pounds acid equivalent per 65 gallons of water, applied twice during the growing season gives fair control. The first rate of application should be 200 gallons per acre and the second rate 150 gallons per acre. After the first application sprouts are numerous but less vigorous, and after the second application (either in the same or following year) any resprouting consists of weak, chlorotic sprigs. Harrowing at this time will control honeysuckle so that pine seedlings can become established and stay ahead of honeysuckle.

Still more effective is a spray treatment with 3-amino-1, 2,4-triazole, mixed at a rate of 4 pounds per 100 gallons of water, plus 4 ounces of a wetting agent. Depending upon the density of the honeysuckle cover, it takes from 100 to 200 gallons of spray material per acre. This herbicide works more slowly than 2,4-D and 2,4,5-T and is translocated into new sprigs that come up the following year. It interferes with chlorophyll formation; the sprayed leaves of honeysuckle turn pink, then pale and eventually drop off. Still, mop-up spraying is needed the next year, using from 50 to 100 gallons of the mixture per acre. Although not tried, harrowing or burning sometime after the final treatment would probably be desirable. Amino triazole, however, should not be sprayed on lands used for food-crop plants or forage areas (fig. 8).



Figure 7.—Mop-up spraying with a power sprayer and amino triazole of a once lush honeysuckle area.



Figure 8.—The right hand portion of this honeysuckle area was treated with amino triazole. Four months later the foliage was gone and most of the stolons were dead, but a mop-up treatment will be needed.

The very best treatment found to date for control of honeysuckle consists of spraying with 2 pounds of amino triazole and 2 pounds of ammonium thiocyanate (Amitrol-T), mixed at rates of 8 pounds of the mixture per 100 gallons of water, plus 4 ounces of a wetting agent. It takes the same volume to spray an acre as with amino triazole, and the action on honeysuckle is similar except that it is somewhat more thorough. The same restrictions as those for amino triazole alone also apply to the use of Amitrol-T.

A soil sterilant (CMU) gave 100 percent control when applied at rates of 60 to 80 pounds per acre. The cost of this material makes this treatment impractical, and in addition it kills the pine overstory.

For kudzu.—In the control of kudzu, complete eradication is necessary because a single surviving plant will soon cover the ground again—and the tallest trees.

A herbicide application of 2,4-D and 2,4,5-T formulated in butoxy ethanol ester or in isooctyl ester, ratio 2:1, 2 pounds acid equivalent per 65 gallons of water is even more effective on kudzu than on honeysuckle. It takes two applications of 150 to 200 gallons per acre, applied during the

growing season when the foliage is full-grown. The second treatment should be applied before other weeds that invariably come in very rank after the first spraying obscure the new sprigs of kudzu.

Although the latest kudzu control measures reflect the results of only one growing season, mist blower application of oil stable 2,4,5-T, 2 pounds acid equivalent, mixed in 4 gallons of non-phytotoxic oil, such as mineral seal oil, and applied at rates of 4 to 5 gallons per acre has given excellent initial results. The first treatment was applied on 0.7 acre in early July 1960, using a portable mist blower. In late September no live kudzu plants were found. Another test at that time was made in exceedingly rank kudzu where access was greatly inhibited (fig. 9) and it was impossible to obtain complete coverage of this kudzu patch in one application. The first application opened things up for a more complete second treatment that was applied in mid-August. Still another kudzu field was treated in early July with a tractor-mounted mist blower. By late September this kudzu field had converted to a dense stand of Johnson grass with very few, widely scattered kudzu sprigs in evidence. When the residue of the dead-appearing kudzu was examined, few live kudzu stolons and rhizomes were found.

The use of non-phytotoxic oil as a carrier has advantages over other solvents. It does not burn the foliage, and because the foliage remains green for several weeks after spraying, the plant functions normally for a longer time, thereby assisting in translocating the herbicides to the roots.

Other advantages of the mist blower method for controlling kudzu are the small volume of mixture needed per acre, the relative ease of applying the spray, and reduced costs.



Figure 9.—Access spraying of rank growing kudzu, using a mist blower with oil stable 2, 4, 5-T (OS) in non-phytotoxic oil. A complete treatment to be given a month later.

SUMMARY

Japanese honeysuckle and kudzu, both introduced from Asia, have spread throughout the South through natural and artificial means until today they constitute major deterrents to regeneration of major forest species. Although they have some economic value for grazing, the problem is one of confining them to specified areas.

Honeysuckle thrives on fertile, nitrogen-rich soil; it spreads vegetatively by layering and sexually by prolific production of seed with a high viability under Piedmont conditions. Kudzu spreads by stolons and rhizomes and, being a nitrogen-fixer, once established it can grow on poorer sites than honeysuckle.

Control studies during the past 9 years include tests of grazing, burning, harrowing, mulching, the use of herbicides, and combination methods. Summer grazing reduces the vigor of both species, but more so for kudzu than honeysuckle.

Controlled burning or harrowing are recommended as pre- and post-treatments to herbicidal spraying of either species.

The most effective herbicide treatment for honeysuckle control consists of spraying with a mixture of 8 pounds Amitrol-T in 100 gallons of water, plus 4 ounces of a wetting agent, applied

with a power sprayer at rates of 200 gallons per acre when the honeysuckle puts on new growth in the spring. This herbicide should not be used in food-crop producing or forage areas.

The most effective herbicide treatment for control of kudzu consists of spraying with a mist blower, using a mixture of 1 gallon (2 pounds acid equivalent) oil stable 2,4,5-T in 4 gallons of non-phytotoxic oil, applied at rates of 5 gallons per acre when kudzu foliage is full grown.

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HERBICIDES TESTED ON THE HITCHITI

<i>Herbicide</i>	<i>Formulation</i>	<i>Company Identification</i>
2,4-D	emulsifiable acid	ACP-638
2,4-D	butoxy ethanol ester	LV-4
2,4-D propionic	butoxy ethanol ester	ACP-685
2,4,5-T	propylene glycol butyl ether ester	Esteron 245
2,4,5-T propionic	butoxy ethanol ester	Weedone
2,4-D and 2,4,5-T		Sherwilkil
2,4-D and 2,4,5-T	butoxy ethanol ester	ACP-977
2,4-D and 2,4,5-T	isooctyl ester	Bramble LV 20-20
2,4-D and 2,4,5-T	tetrahydrofurfuryl ester	Swift 2-2
4 chlorophenoxy acetic acid	butoxy ethanol ester	ACP-903
2 methyl, 4 chlorophenoxy-acetic acid		ACP-904
Polychlorobenzoic acid		Benzac
2,3,6-trichlorophenylacetic acid		Fenac
dimethylamine salt of trichlorobenzoic acid		Trysben 200
2,2-dichloropropionic acid		Radapon
80 percent ammonium sulfamate		Ammate
3-amino-1,2,4-triazole		Amizol
3-amino-1,2,4-triazole and ammonium thiocyanate		Amitrol-T
3-(p-chlorophenyl)-1,1 dimethylurea		CMU

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